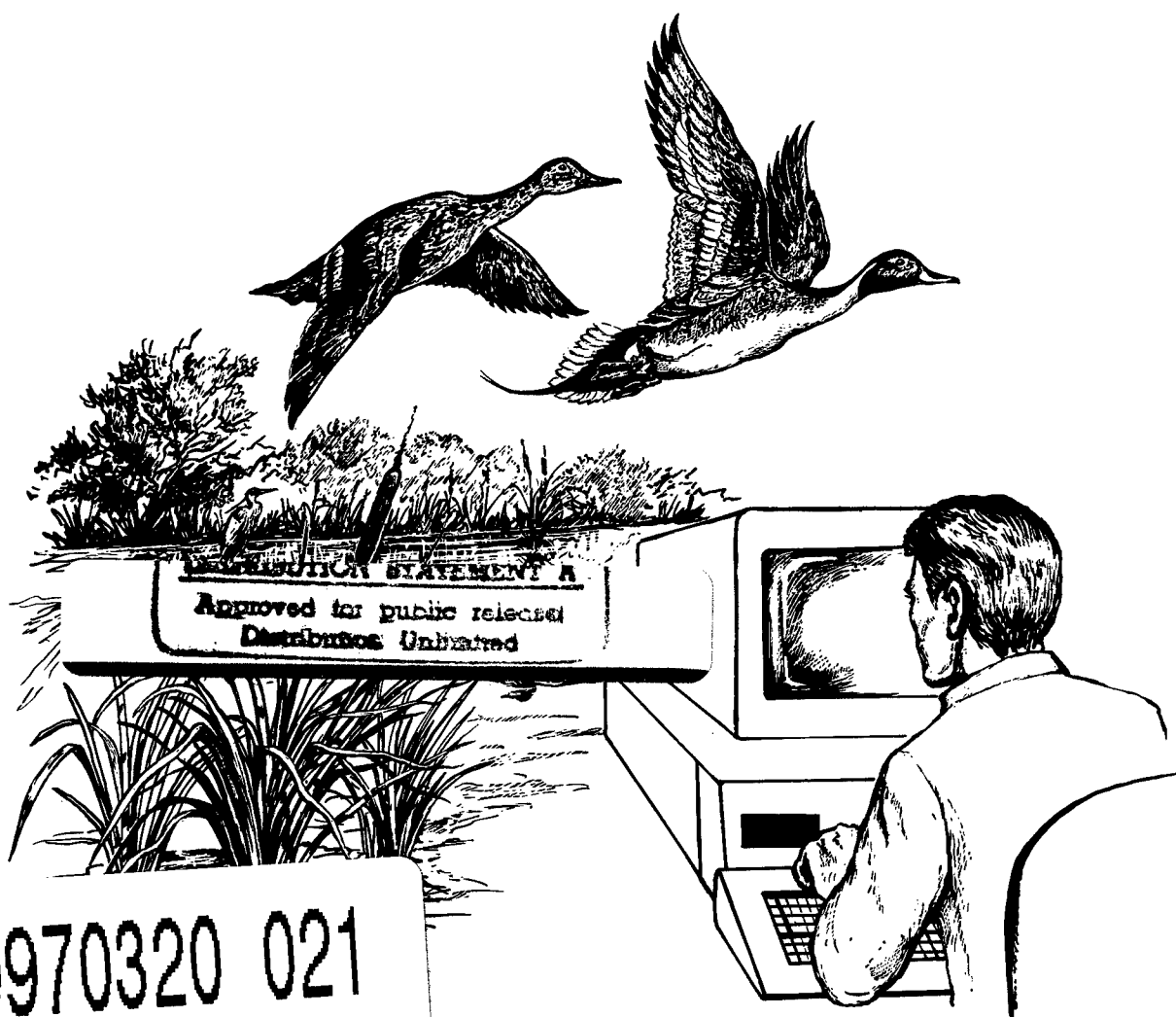


DUCKDATA: A Bibliographic Data Base for North American Waterfowl (Anatidae) and Their Wetland Habitats



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DUCKDATA: A Bibliographic Data Base for North American Waterfowl (Anatidae) and Their Wetland Habitats

By **Kenneth J. Reinecke**
Don Delnicki

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by

Kenneth J. Reinecke and Don Delnicki

*U.S. Fish and Wildlife Service
Patuxent Wildlife Research Center
900 Clay Street
Vicksburg, Mississippi 39180*

Abstract. The data base contains >6,700 references to the ecology of waterfowl (Anatidae) and their wetland habitats. The emphasis is on North American waterfowl, but other English-language publications that concern Holarctic species or address relations of general interest are included. The bibliographic data are in computer files that can be edited, updated, and searched using a microcomputer and data base management software. Analysis of the bibliographic records indicates that the average number of waterfowl publications appearing each year increased from 2 during 1900-09 to >250 during 1980-89. Growth of the literature was exponential through the 1970's, the number of references doubling every 10-12 years. However, the rate of increase apparently slowed during the 1980's. Access to the waterfowl data base can help wildlife researchers, managers, and educators prepare proposals, manuscripts, reading lists, and management plans. Copies of the DUCKDATA data base are available from the authors on 3.5- or 5.25-inch diskettes formatted for PC-DOS or MS-DOS microcomputers in files specific to the bibliography data management program Pro-Cite (Personal Bibliographic Software, Inc., P.O. Box 4250, Ann Arbor, Michigan 48106); an ASCII file in comma-delimited record and field format; and an ASCII file with citations formatted in the style of *The Journal of Wildlife Management*.

Key words: Anatidae, bibliography, data base, ducks, geese, North America, swans, waterfowl, waterfowl habitats, wetlands.

Card files used to provide a simple and flexible method for maintaining research bibliographies (Mosby and Burns 1980). However, proliferation of scientific information in recent decades has necessitated more sophisticated means of information management. Comprehensive information services such as DIALOG (Dialog Information Services, Inc., 3460 Hillview Ave., Palo Alto, California 94304) now provide electronic access to bibliographic data for the scientific literature. However, even information services have limitations. The development of effective strategies for searching

comprehensive data bases often requires technical assistance because of word synonymies and software complexity. Also, automated data bases may not include book titles and retrospective searches of automated data bases generally are limited to literature published during the last 20-30 years (Moore 1980).

An alternative strategy is to combine the best features of manual and electronic methods of literature search. For example, a microcomputer data base of pertinent references can be compiled through a manual search of historical literature

and maintained thereafter by subscription to electronic information services. A bibliography of this type was developed cooperatively by the U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers for organizing references to wetland ecosystem functions and values (Miller and Schneller-McDonald 1988). Availability of microcomputers with high-capacity data storage devices and of software for managing bibliographic data (e.g., Wachtel 1987; Saari and Foster 1989) makes development and use of such bibliographies an attractive alternative.

Our report describes a bibliographic data base for published literature on North American waterfowl and their wetland habitats, and explains the scope and potential uses of the bibliography. The data base is available in an electronic format compatible with PC-DOS and MS-DOS microcomputers that have adequate data storage capacity.

Scope and Coverage

Our principal goal is to provide a comprehensive bibliography of published literature for North American waterfowl and their wetland habitats. Coverage of literature published outside of North America emphasized English-language publications about Holarctic species or relations of general research or management interest. Most of our effort was allocated to systematically searching for waterfowl references in scientific journals, books, graduate theses, and publications of state, provincial, and federal wildlife agencies. We included graduate theses in the data base whether or not the author had published results elsewhere. References that came to our attention indirectly through bibliographic indices (e.g., *Wildlife Review*) were subsequently checked for accuracy at libraries. Table 1 illustrates major sources consulted and extent of coverage at the time of writing.

Publications on wetland ecology were included only when they emphasized wetlands as waterfowl habitat. We did not attempt to survey the literature on wetland ecosystems, except to include several recent texts (Weller 1981; Mitsch and Gosselink 1986) and conference proceedings (Good et al. 1978; Greeson et al. 1979; Gopal et al. 1982) as an introduction to this literature (also see Miller and Sch-

Table 1. *List of original sources searched for references to include in the waterfowl bibliography data base.*

Source ^{a,b}	Years included ^c
Acta Ornithol.	1955-88
Am. Midl. Nat.	1909-89
Am. Nat.	1942-89
Anim. Behav.	1953-89
Arch. Environ. Contam. Toxicol.	1973-89
Arctic	1948-89
Ardea	1913-89
Auk	1884-1989
Aust. Wildl. Res.	1974-89
Behav. Ecol. Sociobiol.	1976-89
Behaviour	1976-89
Behav. Suppl.	1950-72
Biol. Conserv.	1968-89
Bird Study	1954-89
Bull. Environ. Contam. Toxicol.	1966-89
Calif. Fish Game	1915-89
Can. Field-Nat.	1887-1989
Can. J. Zool.	1950-89
Can. Wildl. Serv. Occas. Pap.	1957-89
Can. Wildl. Serv. Rep. Ser.	1966-87
Colon. Waterbirds	1978-89
Condor	1899-1989
Dev. Psychobiol.	1968-89
Ecol. Monogr.	1931-89
Ecology	1920-89
Environ. Res.	1967-89
Environ. Toxicol. Chem.	1982-89
Ethology	1944-89
Evolution	1947-89
Finn. Game Res.	1948-84
Holarct. Ecol.	1978-89
Ibis	1943-89
Ill. Nat. Hist. Surv. Bull.	1876-1988
Ill. Nat. Hist. Surv. Notes	1933-89
J. Anim. Ecol.	1932-89
J. Appl. Ecol.	1964-89
J. Biogeogr.	1974-89
J. Field Ornithol.	1930-89
J. Gt. Lakes Res.	1977-89
J. Wildl. Dis.	1964-89
J. Wildl. Manage.	1937-89
Living Bird	1962-81
Marine Pollut. Bull.	1970-89
Northwest. Nat.	1920-88
N.Y. Fish Game J.	1954-85
Oecologia (Berl.)	1968-89
Oikos	1950-89
Ornis Fenn.	1924-89
Ornis Scand.	1970-89
Pestic. Monit. J.	1967-81
Prairie Nat.	1969-89

Table 1. (Continued).

Source ^{a,b}	Years included ^c
Proc. Int. Waterfowl Symp.	1975-89
Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies	1947-89
Southwest. Nat.	1956-89
Trans. N. Am. Wildl. Nat. Resour. Conf.	1937-89
Wildfowl	1949-89
Wildl. Monogr.	1958-89
Wildl. Soc. Bull.	1973-89
Wilson Bull.	1889-1989
Wis. Dep. Nat. Resour. Tech. Bull.	1950-88
U.S. Fish Wildl. Serv. Technical Series	through 1989

^a Only current titles are listed (e.g., *Bird-Banding* was continued as *J. Field Ornithol.*).

^b Abbreviations follow BioSciences Information Service (1990).

^c Coverage of some journals was <100% because individual issues were unavailable at the time we visited libraries.

neller-McDonald 1988). We generally excluded Pittman-Robertson project reports (available from the Fish and Wildlife Reference Service, 5430 Grosvenor Lane, Bethesda, Maryland 20814), progress reports, and articles in state ornithological journals or proceedings of state academies of science. We also excluded anecdotal reports of waterfowl distributions published in early issues of journals such as *The Auk*, *The Condor*, and *The Wilson Bulletin*, unless we believed they had historical significance. Determining the merit of and preparing accurate citations for papers published in proceedings of conferences, symposia, and workshops was difficult. As Bart and Anderson (1981) noted, it often is unclear whether these proceedings are intended to be part of the permanent scientific literature. We did not search for publications about sport hunting of waterfowl, but we included those that came to our attention because they often contain interesting qualitative information about waterfowl behavior, migration, and habitat use.

Organization of the Bibliography Data Base

The waterfowl bibliography is organized in record and field format typical of most data bases.

Each record contains information for one citation; fields within records contain data necessary for reconstructing or characterizing individual citations. The format we use for each record includes seven fields: author, editor, title, year of publication, source, verification status, and keywords.

Author, title, year, and source fields have conventional meanings (cf. Fig. 1). The editor field indicates whether those listed in the author field served as editors rather than authors of the document (Fig. 1, A versus B). The verification field indicates whether the information in a bibliography record was compared to the original reference. We verified >99% of the records.

We did not include the underlining often used to identify italicized words in the title and source fields (e.g., scientific names; Fig. 1C), because codes used to control underlining vary among hardware and software systems. Another departure from conventional style is that we added asterisks to the author fields of records in which author's names are followed by "Jr.", "Sr.", or Roman numerals (Fig. 1C). We marked these records for further editing with word processing software because few data base management programs are capable of formatting such names in *The Journal of Wildlife Management* style (Ratti and Ratti 1988; CBE Style Manual Committee 1983).

Index terms or key words greatly enhance the value of a bibliography. Selection of keywords for our bibliography was subjective, but included at least the general and specific subjects of each reference. For example, papers on avian botulism might be indexed with the key words "Diseases/Avian Botulism" or "Population Dynamics/Natural Mortality/Diseases/Avian Botulism". We also included geographic index terms when relevant locations were evident from the title, plus "Thesis" as a key word for all graduate theses. Common names of waterfowl were included as keywords, with usage following the American Ornithologists' Union (1983) checklist or Johnsgard (1978) for species not covered by the check-list.

Our experience has been that having an alphabetized list of key words facilitates searching for references and maintaining consistent key word usage when adding references to the data base. Pro-Cite and similar programs can prepare key word lists as needed; alternatively, we can provide

A	
[AU] Author(s):	Talent, L. G.; Jarvis, R. L.; Krapu, G. L.
[ED] Editor(s):	
[TI] Title:	Survival of mallard broods in south-central North Dakota.
[YR] Year:	1983.
[SO] Source:	Condor 85:74-78.
[VE] Verified:	Verified
[KW] Keywords:	Population Dynamics/Brood Survival/Mallards/North Dakota

B	
[AU] Author(s):	Trefethen, J. B.
[ED] Editor(s):	ed.
[TI] Title:	Wood duck management and research: a symposium.
[YR] Year:	1966.
[SO] Source:	Wildl. Manage. Inst., Washington, D.C. 212pp.
[VE] Verified:	Verified
[KW] Keywords:	Symposium/Wood Ducks

C	
[AU] Author(s):	Heppner, F. H.; Convisar, J. L.; Moonan* Jr., D. E.; Anderson, J. G. T.
[ED] Editor(s):	
[TI] Title:	Visual angle and formation flight in Canada geese (<i>Branta canadensis</i>).
[YR] Year:	1985.
[SO] Source:	Auk 102:195-198.
[VE] Verified:	Verified
[KW] Keywords:	Flight Formation/Canada Geese/Advantages

Fig. 1. Record and field format of the waterfowl bibliography data base, illustrating variations in data entry.

a copy of our working list. Searching for references also is facilitated by using software that supports wildcard characters and Boolean operators. These features give users the ability to develop a wide range of search strategies for selecting records from the data base.

Analysis of the Data Base

The bibliography is complete through 1989, although a limited number of older citations undoubtedly will be added in the future. To identify major sources of waterfowl literature, characterize changes in the number of waterfowl publications over time, and determine which species were emphasized in waterfowl research, we used Pro-Cite to determine the numbers of citations that satisfied certain search criteria.

Sources of Waterfowl Literature

The source field of the bibliography records was used to determine the distribution of references among major publication outlets (Table 2). Major sources of waterfowl literature were scientific

journals publishing papers in wildlife ecology (25.2%) or ornithology (20.2%), graduate theses (10.1%), and publication outlets specializing in waterfowl studies (11.8%). However, 32.7% of the citations were from miscellaneous sources other than the major outlets noted (Table 2). The diversity of sources of waterfowl literature was not surprising; a study conducted in the 1960's indicated that 138 journals were devoted exclusively to avian biology and >1,000 journals published papers of interest to ornithologists (Baldwin and Oehlerts 1964).

Increase of Waterfowl Publications

Of waterfowl publications included in the data base, the number was <2 for the years before 1900, exceeded 10 per year for the first time in 1920, and reached a maximum of 300 in 1988 (Fig. 2). To gain further insight into the pattern of change, we fitted selected mathematical models to the number of publications appearing each year. A logistic model fit the data best (Fig. 2) and showed that the number of references added to the bibliography each year has grown geometrically, doubling at intervals of 10-12 years. Seemingly, the published literature of mammal-

Table 2. *Distribution among major publication outlets of citations included in the waterfowl bibliography data base.*

Orientation of publication outlet ^a	Citations	
	Number	%
Primary emphasis on waterfowl		
Wildfowl	267	4
Proc. Int. Waterfowl Symp.	192	3
Federal wildlife agency reports		
U.S. Fish Wildl. Serv.	205	3
Can. Wildl. Serv.	137	2
Subtotal	801	12
General ornithology		
Auk	387	6
Wilson Bull.	265	4
Condor	212	3
Others	496	7
Subtotal	1,360	20
Wildlife management and research		
J. Wildl. Manage.	845	13
Trans. N. Am. Wildl. Nat. Resour. Conf.	413	6
Proc. Ann. Conf. Southeast. Assoc. Fish Wildl. Agencies	177	3
Wildl. Soc. Bull.	139	2
J. Wildl. Dis.	128	2
Subtotal	1,702	25
Graduate theses	681	10
Other sources ^b	2,203	33
Totals^c	6,747	100

^a Abbreviations follow BioSciences Information Service (1990).

^b Includes monographs, state resource agency publications, symposium proceedings, textbooks, and miscellaneous journals.

^c As of 30 June 1990; percents may not sum correctly because of rounding.

ogy and the sciences in general have exhibited a similar pattern of growth (Anderson and Van Gelder 1970). Continued geometric growth of the waterfowl literature is unlikely; however, projections from the logistic model indicate that the number of publications appearing each year probably will reach at least 500–600 before stabilizing.

Species Emphasized in Waterfowl Research

The bibliography includes references pertaining to 102 species of waterfowl. Publications concerning species that are abundant, widely distributed, or have been the subject of long-term management or research efforts dominate the data base (Table 3). There were nearly twice as many publications on mallards (*Anas platyrhynchos*) and Canada geese (*Branta canadensis*) as on any other species. Wood ducks (*Aix sponsa*), lesser snow geese (*Chen caerulescens*), and American black ducks (*Anas rubripes*) were the next most popular subjects for study. The common eider (*Somateria mollissima*) was the only sea duck (Tribe Mergini) featured in >1% of the publications (Table 3).

Anderson et al. (1974) prepared a bibliography of about 900 references on mallard population ecology. In comparison, our data base currently includes 794 citations indexed with the key word "mallards" (Table 3). Differences between the totals can be attributed to the criteria used for selecting references in the two studies (Anderson et al. 1974). More important, we did not use the key word mallards for some of the general references on waterfowl populations included in Anderson et al. (1974).

Potential Applications

The data base can be a valuable tool for wildlife managers, researchers, and educators. For waterfowl managers preparing environmental impact statements or management plans that require extensive documentation (e.g., U.S. Fish and Wildlife Service 1988), the bibliography can provide access to most of the published literature on North American waterfowl. For graduate students, faculty members, and agency scientists, the bibliography will facilitate preparation of proposals, study plans, theses, and research manuscripts. Wildlife educators teaching courses in waterfowl ecology can use the keyword index of the data base to prepare reading lists, and students taking waterfowl courses can search the data base to obtain literature for seminar presentations. We also hope that availability of the bibliography will better

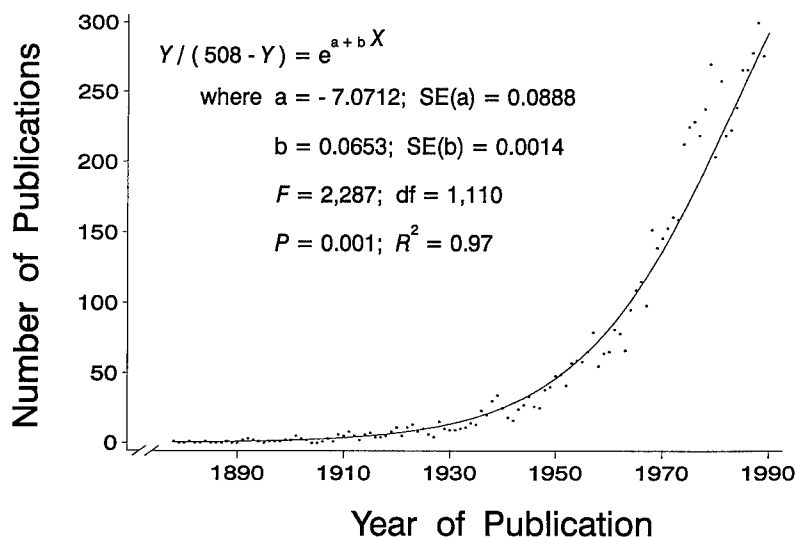


Fig. 2. Logistic curve fitted to the number of waterfowl studies published annually during 1878-1989

integrate waterfowl biology and the broader field of ornithology by enabling ornithologists to use waterfowl literature more effectively, and by enabling waterfowl biologists to allocate more time to the study of other ornithological and ecological literature.

Distribution of the Data Base

Copies of the DUCKDATA data base are available from the authors on request. We use a PC-DOS computer system and can provide data on 360k or 1.2M 5.25-inch diskettes and on 720k or 1.44M 3.5-inch diskettes. However, we prefer to work with 3.5-inch diskettes and ask that a sufficient number (see below) of formatted media accompany requests for data.

The bibliographic data are available in three file formats. Users of Pro-Cite will be provided Pro-Cite data base and punctuation files, which require approximately 3.0M of memory. Others will be provided an ASCII file in comma-delimited record and field format (approx. 1.5M) or an ASCII file with references formatted in the style of *The Journal of Wildlife Management* (approx. 1.0M). Data in comma-delimited format can be imported by many data base management programs, which can be used to search, sort, edit, and update the bibliography as we are doing with Pro-Cite. The ASCII file with citations in *Journal of Wildlife Manage-*

ment format can only be browsed and printed with DOS commands, or updated and searched to a limited extent with word-processing programs capable of reading ASCII files.

Users of DUCKDATA may want to modify the data set by adding references that reflect areas of personal research or management interest (e.g., population dynamics, mating systems, etc.). There are at least two ways to customize the bibliography

Table 3. Number and percentage of records that pertain to selected species of waterfowl; species included in the table occurred as key words in $\geq 1\%$ of the records in the waterfowl bibliography data base.

Species	Citations	
	Number	Percent of Total
Mallard (<i>Anas platyrhynchos</i>)	794	11.8
Canada goose (<i>Branta canadensis</i>)	546	8.1
Wood duck (<i>Aix sponsa</i>)	318	4.7
Lesser snow goose (<i>Chen caerulescens</i>)	220	3.3
American black duck (<i>Anas rubripes</i>)	216	3.2
Common eider (<i>Somateria mollissima</i>)	138	2.0
Brant (<i>Branta bernicla</i>)	102	1.5
Northern pintail (<i>Anas acuta</i>)	99	1.5
Canvasback (<i>Aythya valisineria</i>)	98	1.5
Blue-winged teal (<i>Anas discors</i>)	93	1.4
Redhead (<i>Aythya americana</i>)	77	1.1
Total	2,701	40.1

without losing the option of replacing the data base that we have provided with an updated version. We recommend that users keep our bibliography in a separate data base or, if all records are included in a single data base, add a field to each record to indicate who provided the reference (e.g., USFWS in place of "Other"). In this way, old records can be deleted as a block, and an updated version of our data base can be incorporated into a customized bibliography without loss of information.

Acknowledgments

This project was initiated in 1976 while the senior author was a graduate student at the University of Maine. Many individuals contributed references and assistance during the 15-year development of the data base, including J. C. Chiplin, M. W. Coulter, D. A. Davenport, S. I. Fefer, D. H. Johnson, D. G. Jorde, C. E. Korschgen, J. R. Longcore, R. B. Owen, Jr., M. D. Schwartz, L. Stone, and T. L. Stone. We are especially grateful to librarians L. J. Garrett and J. E. Corley, who patiently responded to numerous requests for references not readily available to us. The manuscript benefitted from reviews by L. J. Garrett and M. D. Schwartz.

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A list of current *Resource Publications* follows.

166. Checklist of Vertebrates of the United States, the U.S. Territories, and Canada, by Richard C. Banks, Roy W. McDiarmid, and Alfred L. Gardner. 1987. 79 pp.
167. Field Guide to Wildlife Diseases. Vol. 1. General Field Procedures and Disease of Migratory Birds, by Milton Friend, Cynthia J. Laitman, and Randy Stothard Kampen. 1987. 225 pp.
168. Mourning Dove Nesting: Seasonal Patterns and Effects of September Hunting, by Paul H. Geissler, David D. Dolton, Rebecca Field, Richard A. Coon, H. Franklin Percival, Don W. Hayne, Lawrence D. Soileau, Ronnie R. George, James H. Dunks, and S. Dwight Bunnell. 1987. 33 pp.
169. Saltcedar Control for Wildlife Habitat Improvement in the Southwestern United States, by Theodore A. Kerpez and Norman S. Smith. 1987. 16 pp.
170. Pesticide Use and Toxicology in Relation to Wildlife: Organophosphorus and Carbamate Compounds, by Gregory J. Smith. 1987. 171 pp.
171. Sand and Gravel Pits as Fish and Wildlife Habitat in the Southwest, by William J. Matter and R. William Mannan. 1988. 11 pp.
172. Satellite Telemetry: A New Tool for Wildlife Research and Management, by Steven G. Fancy, Larry F. Pank, David C. Douglass, Catherine H. Curby, Gerald W. Garner, Steven C. Amstrup, and Wayne L. Regelin. 1988. 54 pp.
173. Key to Acanthocephala Reported in waterfowl, by Malcolm E. McDonald. 1988. 45 pp.
174. Obsolete English Names of North American Birds and Their Modern Equivalents, by Richard C. Banks. 1988. 37 pp.
175. Procedures for the Analysis of Band-recovery Data and User Instructions for Program MULT, by Michael J. Conroy, James E. Hines, and Byron K. Williams. 1989. 61 pp.
176. Sago Pondweed (*Potamogeton pectinatus* L.): A Literature Review, by Harold A. Kantrud. 1990. 89 pp.
177. Field Manual for the Investigation of Fish Kills, by Fred P. Meyer and Lee A. Barclay. 1990. 120 pp.
178. Section 404 and Alterations in the Platte River Basin of Colorado, by Douglas N. Gladwin, Mary E. Jennings, James E. Roelle, and Duane A. Asherin. 1990. 19 pp.
179. Hydrology of the Middle Rio Grande From Velarde to Elephant Butte Reservoir, New Mexico, by Thomas F. Bullard and Stephen G. Wells. 1991. 56 pp.
180. Waterfowl Production on the Woodworth Station in South-central North Dakota, 1965-1981, by Kenneth F. Higgins, Leo M. Kirsch, Albert T. Klett, and Harvey W. Miller. 1992. 79 pp.
181. Trends and Management of Wolf-Livestock Conflicts in Minnesota, by Steven H. Fritts, William J. Paul, L. David Mech, and David P. Scott. 1992. 27 pp.
182. Selection of Prey by Walleyes in the Ohio Water of the Central Basin of Lake Erie, 1985-1987, by David Wolfert and Michael T. Burr. 1992. 14 pp.
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